

THE IMPACT OF NOSOCOMIAL INFECTION ON PATIENTS

Annotation: Nosocomial infections, also known as hospital-acquired infections, pose a significant threat to patient health and healthcare systems worldwide. This study examines the multifaceted impact of nosocomial infections on patients, encompassing physical, psychological, and economic consequences. The analysis highlights the primary sources and risk factors contributing to the prevalence of such infections, including inadequate sterilization protocols, antibiotic resistance, and overcrowded healthcare facilities.

Key words: Nosocomial infection, Hospital-acquired infections (HAIs), Patient outcomes, Healthcare-associated infections (HCAIs), Infection control, Antibiotic resistance, Patient morbidity, Patient mortality, Healthcare costs.

Nosocomial (from the Latin "nosocomium" - hospital and the Greek "nosokomeo" - to care for a patient) infections are any clinically detectable infectious disease that develops in a patient when seeking medical care in a hospital or during a stay there, as well as any infectious disease that develops in a hospital employee as a result of his work in this institution [1]. Nosocomial infections include infections that were not in the incubation period and did not manifest clinically at the time of the patient's admission to the hospital and developed no earlier than 48 hours after hospitalization, as well as infections that arose as a result of previous hospitalization [2]. Nosocomial infections are important factors in morbidity and mortality. They lead to an increase in the duration of hospitalization and additional treatment costs. Thus, in the United States in 1995, the cost of treating nosocomial infections was \$ 4.5 billion, they became the direct or indirect cause of 88 thousand deaths [3]. In the UK,

nosocomial infections cause 5,000 deaths annually and contribute to an additional 15,000 fatal outcomes [4].

Epidemiology of nosocomial infections

In 90% of cases, nosocomial infections are caused by bacteria, much less often by viruses, fungi or protozoa. Along with obligate pathogens, nosocomial infections are also caused by opportunistic microorganisms with relatively low pathogenicity, especially in patients with a severe course of the underlying and/or concomitant diseases. Thus, in connection with the spread of HIV infection over the past decade, the etiologic role of fungi, *Mycobacterium tuberculosis* and *Mycobacterium avium*, and the herpes simplex virus has increased. The intensive use of broad-spectrum antibiotics has led to an increase in urinary tract infections caused by *Candida* spp. Nosocomial fungal infections also develop relatively frequently in patients who have undergone major surgical interventions, especially organ transplants, and who receive chemotherapeutic agents for the treatment of oncological diseases.

Large studies in the USA and Europe have shown that over the past two decades there have been changes in the frequency, localization, and distribution of etiologic factors of nosocomial infections. The emergence of new pathogens of opportunistic infections has led to the emergence of new problems of antibiotic resistance.

In the early 70s of the last century, according to the SENIC (Study of Efficacy of Nosocomial Infection Control) study, the first place among nosocomial infections was occupied by urinary tract infections (42%) and surgical wound infections (24%). Respiratory tract infections accounted for approximately 11%.

In the early 90s, The incidence of nosocomial pneumonia increased to 15–17%, exceeded 30% in 1995, and the latest European studies have obtained even higher figures – 46.9%. Thus, nosocomial pneumonia is the most common nosocomial infection in Europe.

In contrast, the incidence of urinary tract infections has declined in the 1990s, apparently due to improved monitoring and prevention, as well as more careful care of urinary catheters. However, urinary tract infections, along with pneumonia, still occupy a leading place among nosocomial infections and are a source of severe secondary bacteremia. For example, in the United States, they account for about 40% of all nosocomial infections and lead to 7,500 deaths annually. Over the past 15–20 years, an increase in the incidence of angioinvasive infections has been observed. In particular, in the United States, the incidence of primary and secondary bacteremia increased by 2.4 times between 1979 and 1987. Depending on the size of the medical institution, the contingent of patients, and the length of hospital stay, it is 1.3–14.5 per 1,000 hospitalized patients. The increase in secondary bacteremia is associated with the widespread use of invasive procedures, antitumor chemotherapy, and immunotherapy, which contribute to the development of sepsis and septic shock. However, secondary bacteremia most often develops in patients with nosocomial pneumonia. The incidence of primary bacteremia remains relatively stable and is at 15%.

Bacteremia, along with pneumonia, is one of the most severe nosocomial infections, often leading to death, and over the past 40 years, an exponential increase in the incidence of deaths due to bacteremia has been noted.

Wound infection is also a common nosocomial infection. Thus, according to a multicenter study that included 231 hospitals in the United States, in the period from October 1986 to April 1996, wound infection ranked second among all microbiologically confirmed nosocomial infections (17.4%), second in frequency only to urinary tract infections (34.5%). According to other studies, the incidence of nosocomial wound infection and skin and soft tissue infection in surgical departments and burn centers averages 8–15%.

Rarer infections include secondary nosocomial meningitis and gastroenteritis. Patients with risk factors may develop pseudomembranous enterocolitis caused by

Clostridium difficile. In recent years, an increase in the incidence of nosocomial tuberculosis has been observed in North America and Europe.

The frequency of isolation of various pathogens depending on the localization of infection is presented in Table 1. Gram-negative microorganisms predominate among the causative agents of burn wound infection, while gram-positive microorganisms are the leading cause of bacteremia. In patients with nosocomial pneumonia, according to the EPIIC study, the most common pathogens are *P. aeruginosa* and *S. aureus*, which are isolated with approximately the same frequency. It is believed that about half of nosocomial infections are currently caused by antibiotic-resistant microorganisms.

Important preventive measures include maintaining cleanliness in the healthcare facility, aseptic technique during invasive procedures, and thorough sterilization of medical instruments [3]. Particular attention is paid to washing and wiping hands with alcohol solutions before and after contact with the patient .

Recommendations for the prevention of nosocomial infections include three main approaches:

- measures aimed at controlling sources of nosocomial pathogens and preventing transmission of infection from patient to patient or from medical personnel to patient — adequate disinfection and care of catheters, ventilator equipment, humidifiers, endotracheal tubes, and dialysis systems;
- measures aimed at preventing contamination in patients with burns and surgical wounds and in patients on mechanical ventilation - antibiotic prophylaxis, local application of antibiotics or antiseptics; for the prevention of pneumonia caused by *P. aeruginosa* and *Acinetobacter*, which often lead to death, the use of polymyxin aerosol and/or endotracheal administration of aminoglycosides is recommended.

For local chemoprophylaxis, poorly absorbed antibiotics are used: polymyxin E, tobramycin (or norfloxacin) and amphotericin B (to prevent fungal colonization). In most studies, injectable cefotaxime was used simultaneously with

local prophylaxis. Antibiotic combinations can be applied to the oral mucosa in the form of sticky pastes or administered through a nasogastric tube. Thus, nosocomial infections continue to be a serious threat to health and life, especially in patients with risk factors. To reduce the incidence of morbidity and mortality caused by nosocomial infections, it is necessary to improve infection control and patient care, improve diagnostic methods and introduce new antimicrobial agents into clinical practice.

References

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